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(58) Field of search
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Selected US specifications from IPC sub-class A43B

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(54) Ventilating mechanisms for shoes

(57) A ventilating mechanism for a shoe comprises a pump located in the shoe and adapted to draw air into and expel air from by pressure applied by the foot. The pump has a pump chamber, a plurality of valved inlet ports for drawing air passing through the pump chamber, and a plurality of valved outlet ports for directing the air toward the toe portion inside of the shoe.

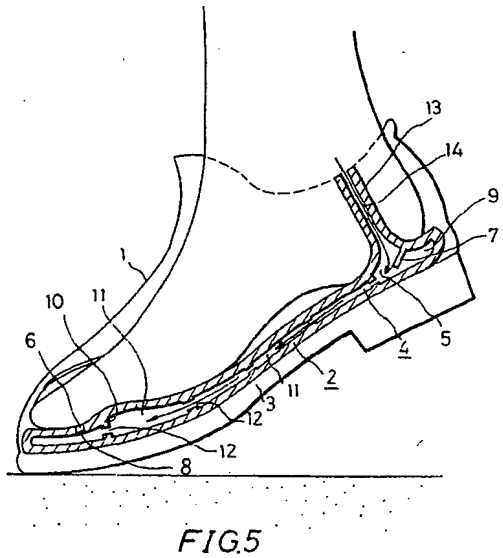

FIG.5

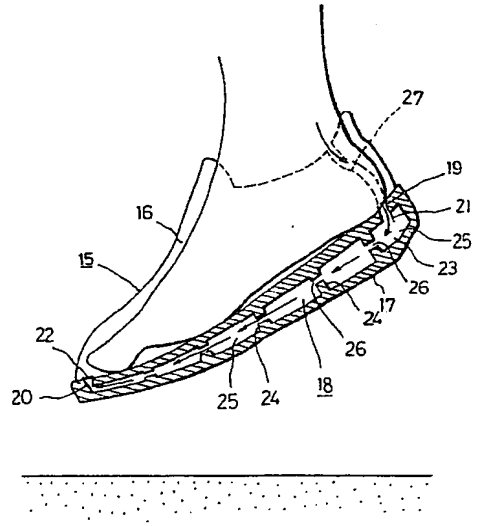

FIG.7

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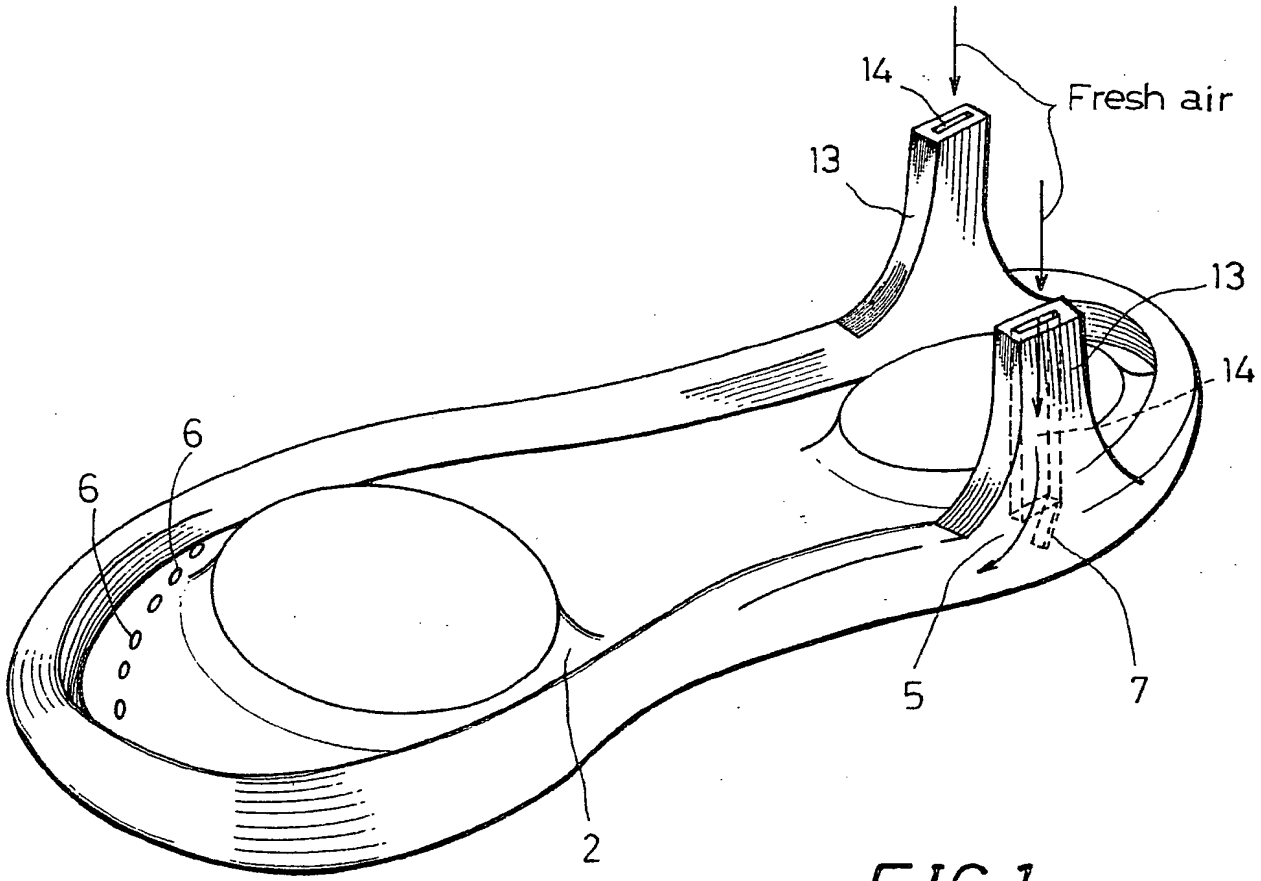
14
Fresh air
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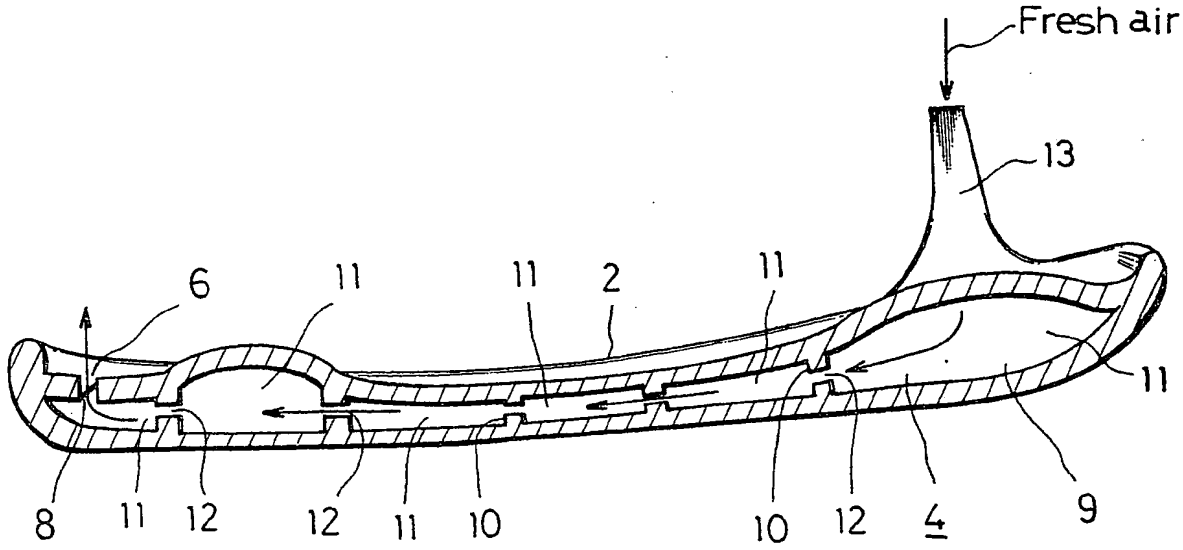
2

FIG.1


Fresh air
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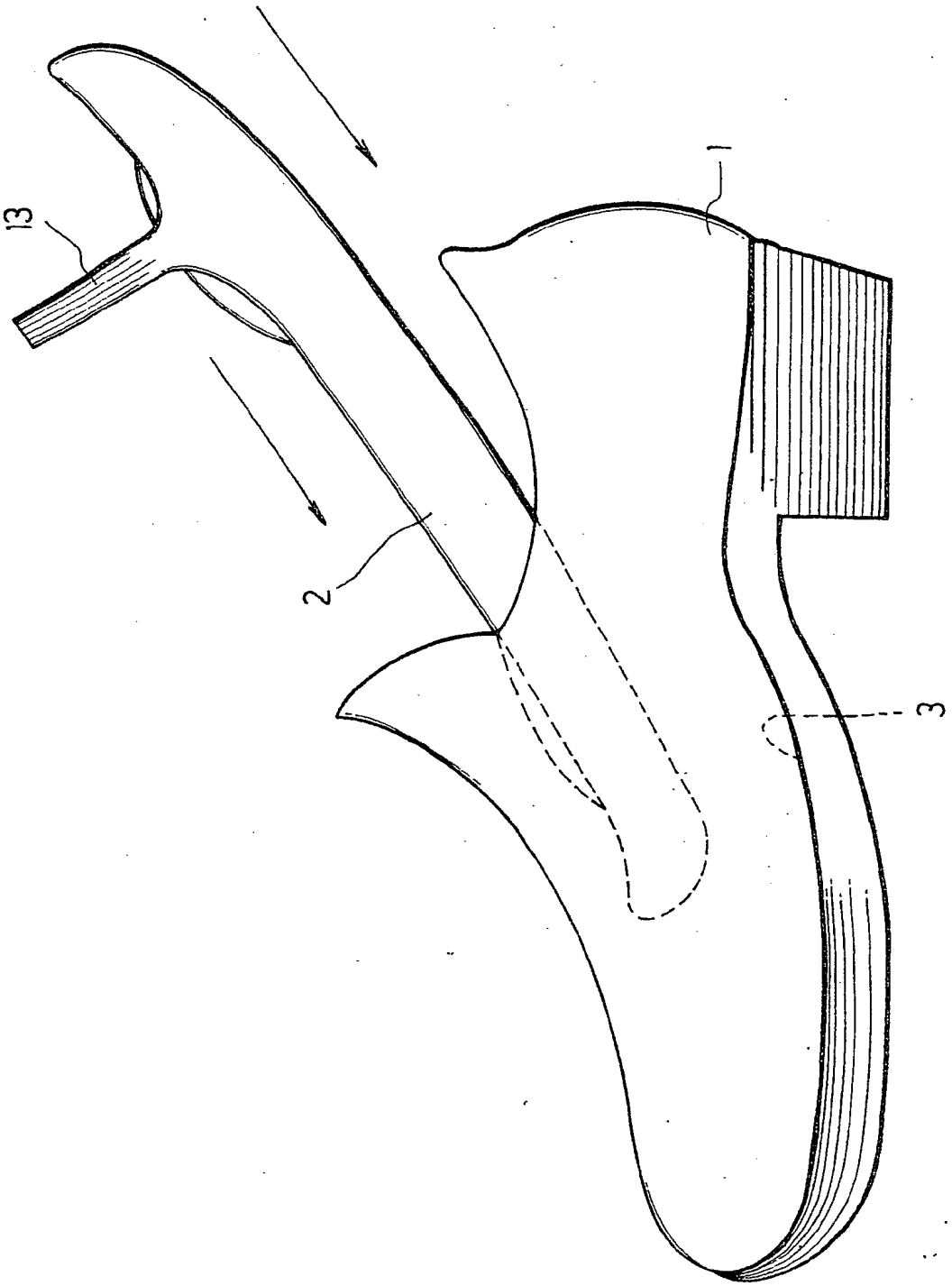

FIG.3

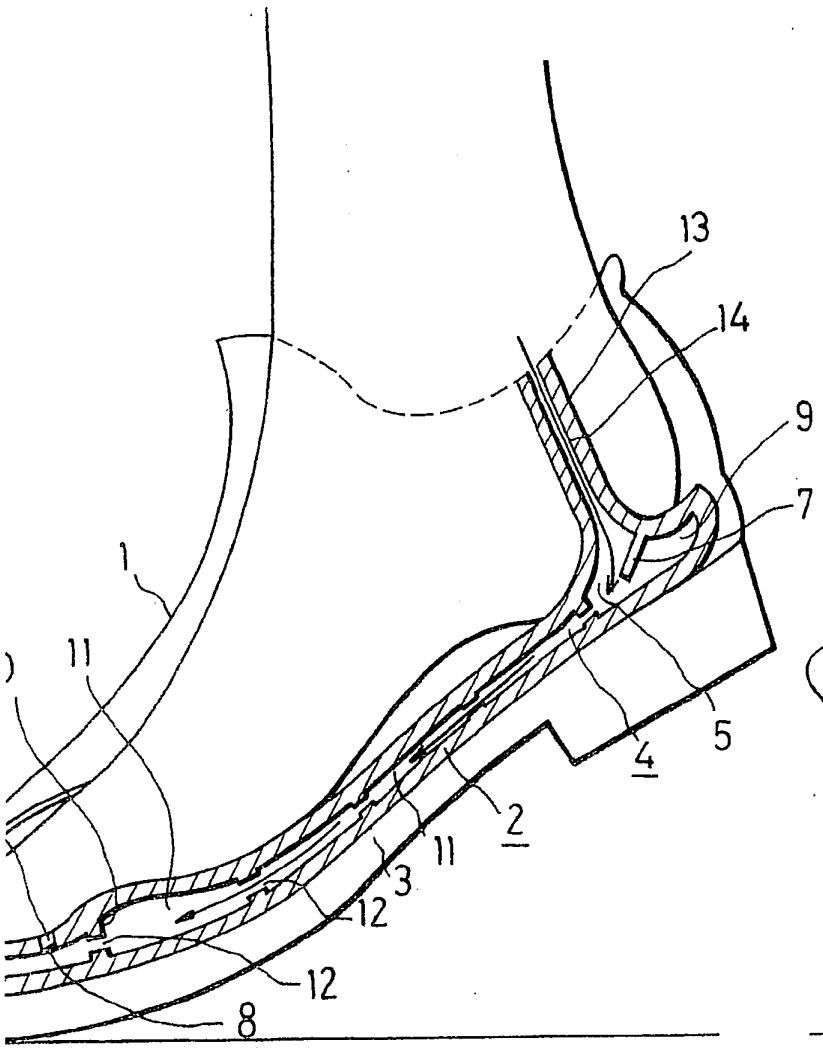

FIG.5

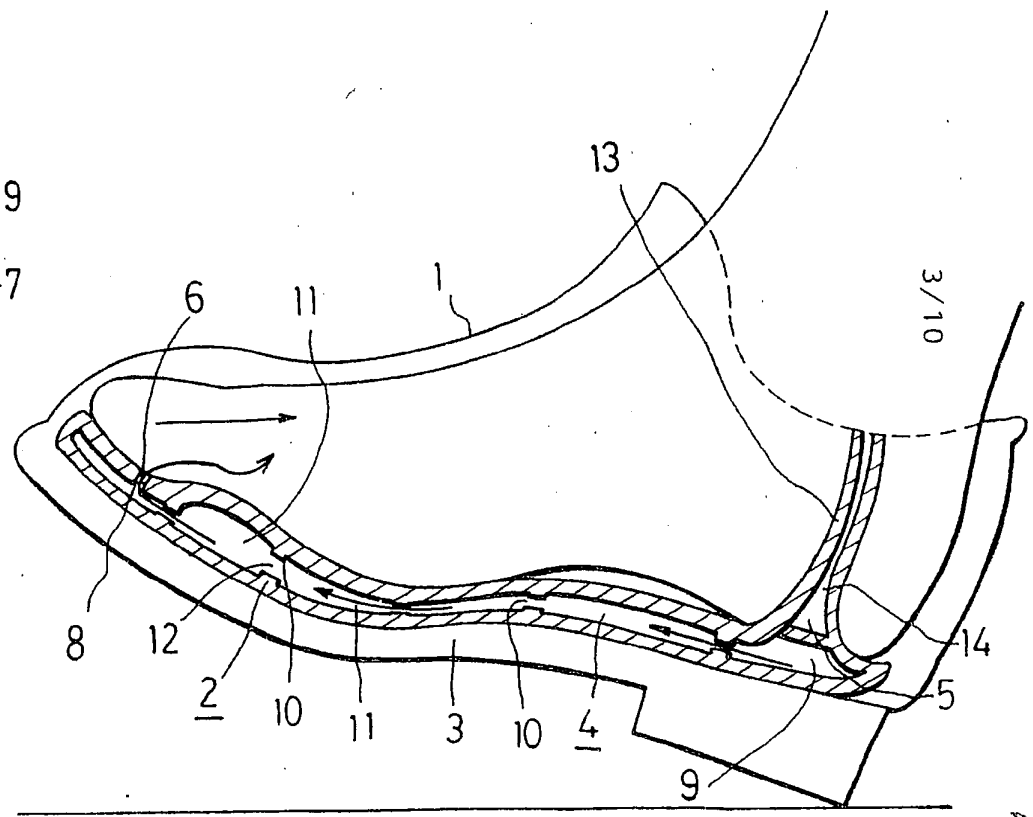

FIG.4

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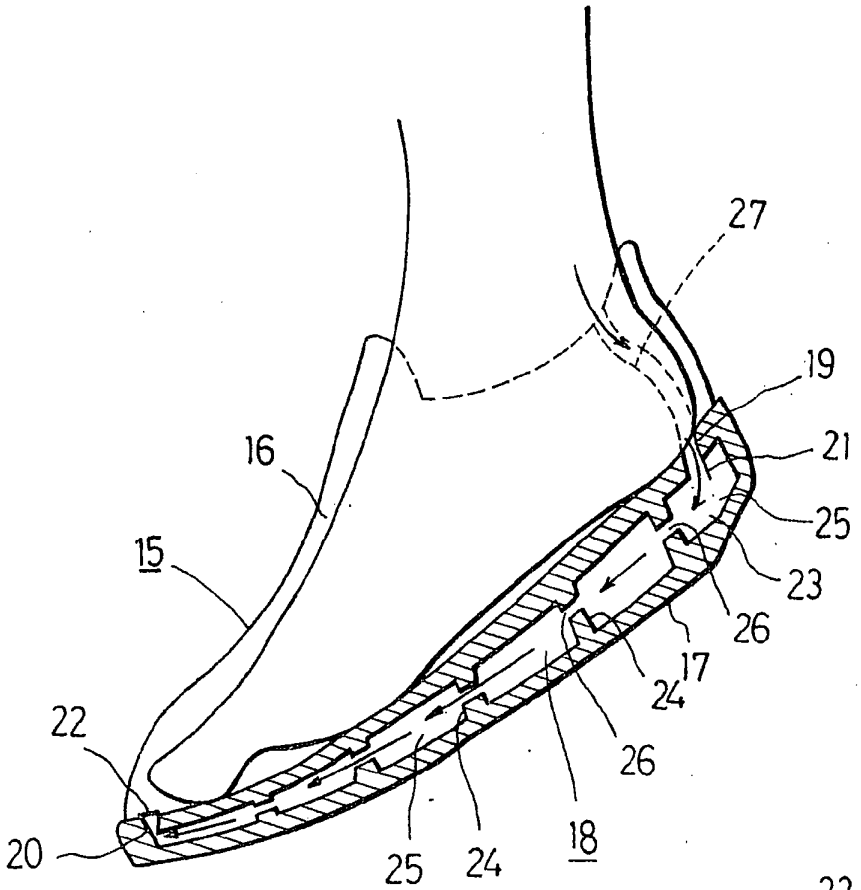

FIG.7

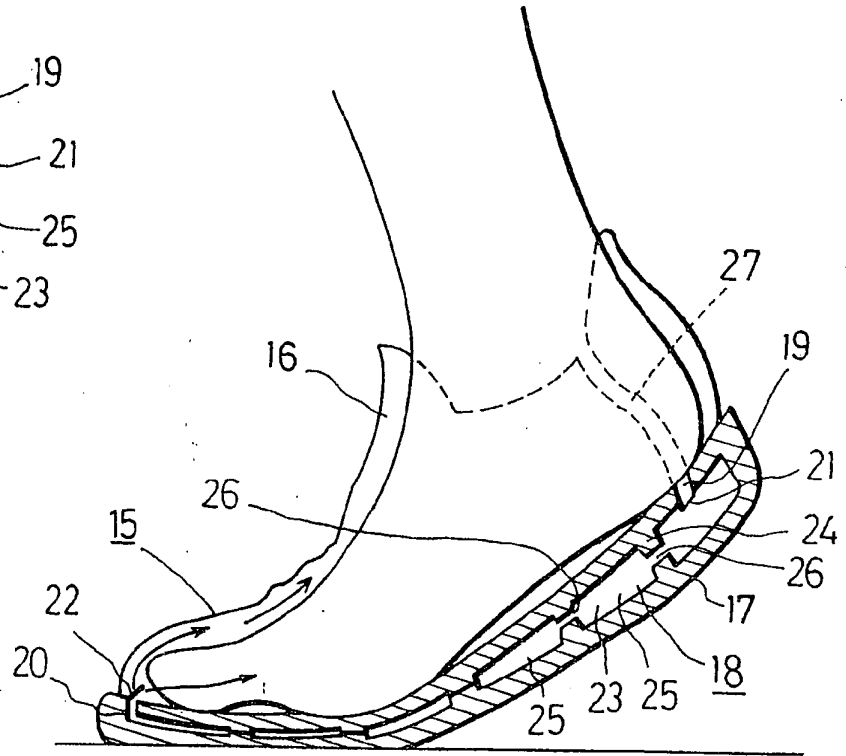

FIG.6

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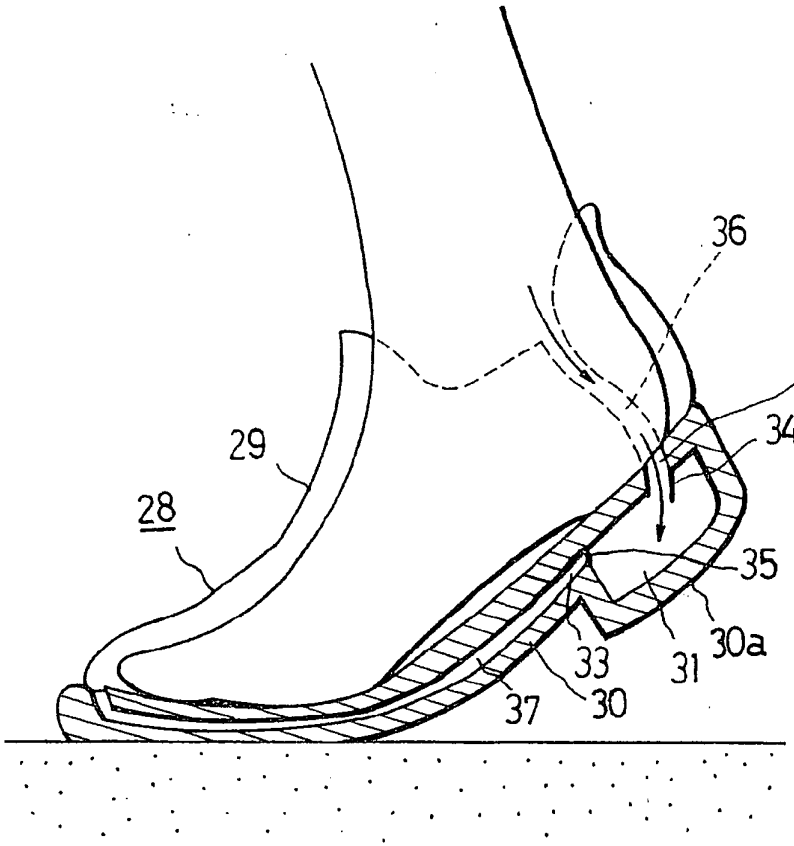

FIG.9

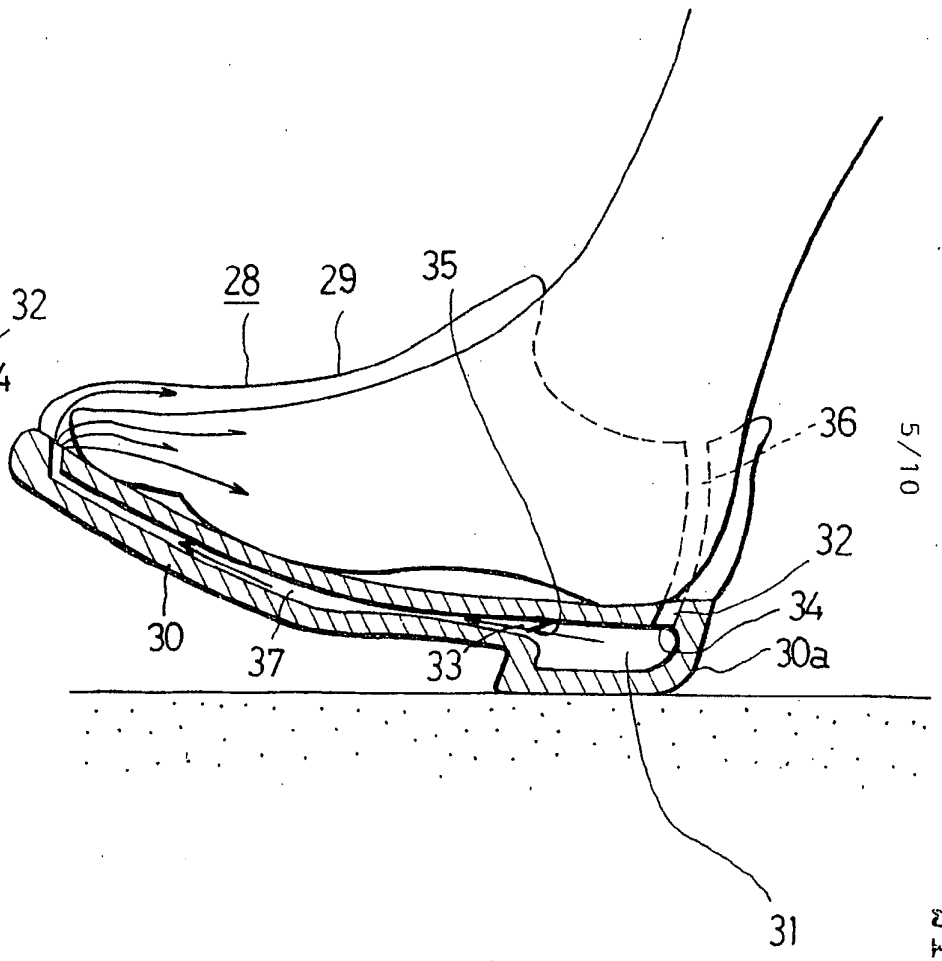

FIG.8

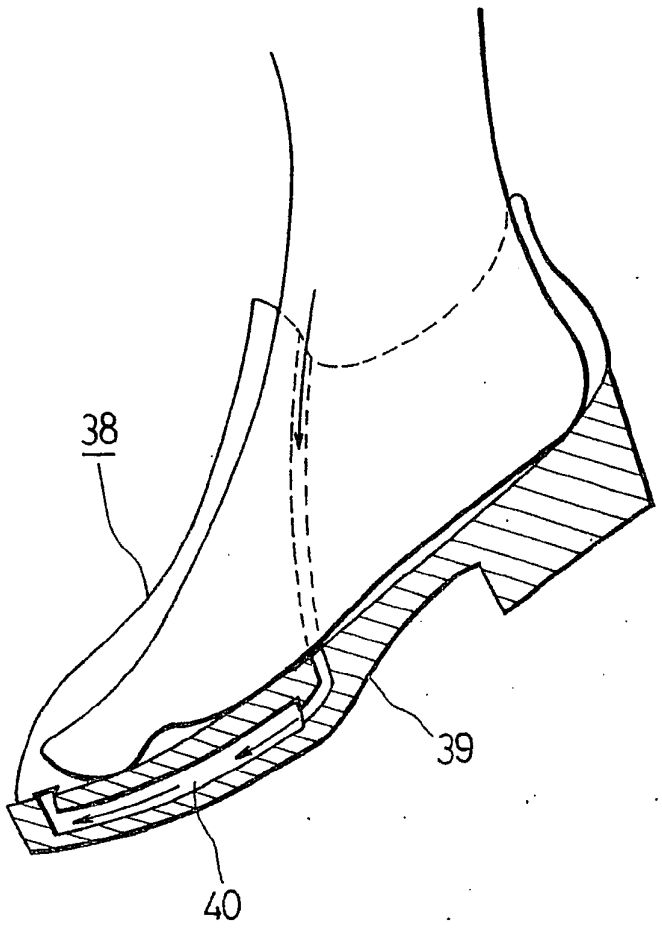

FIG.11

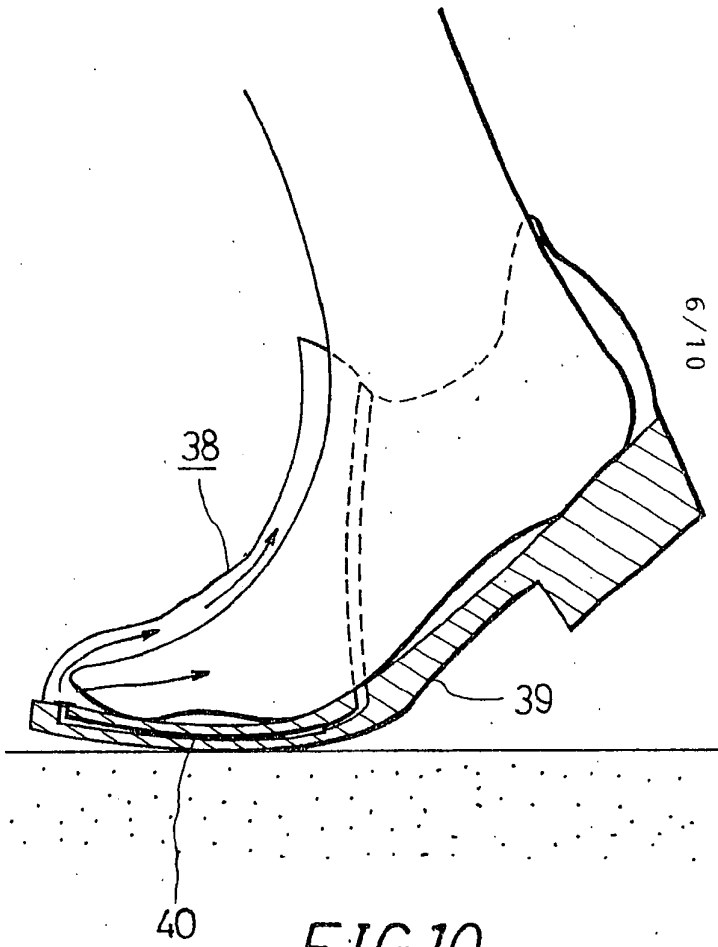

FIG.10

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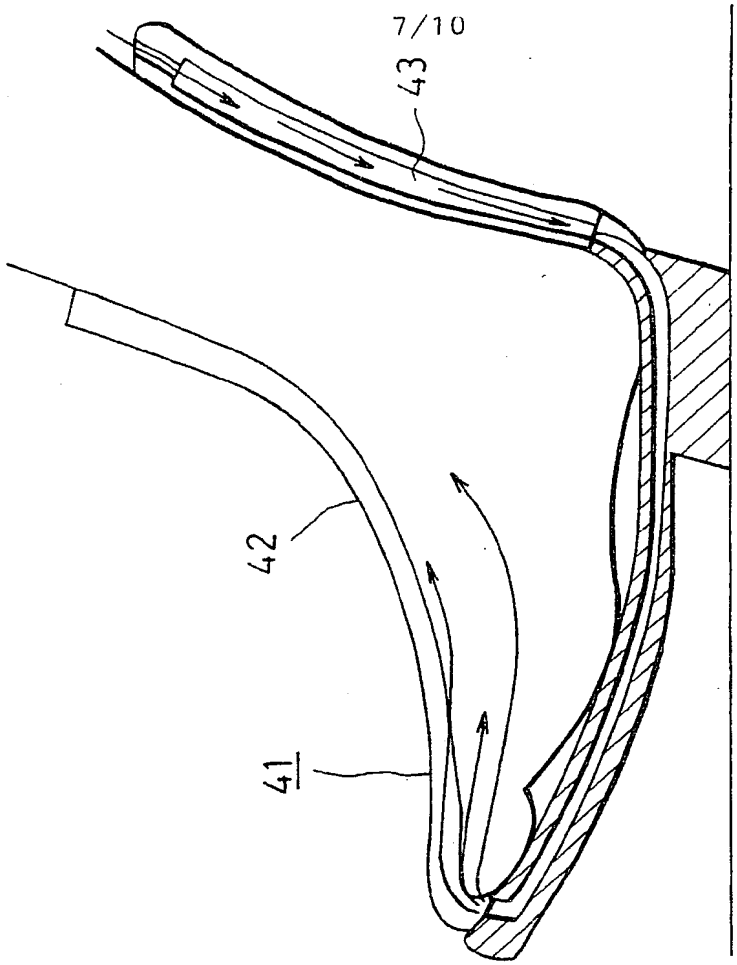

FIG12

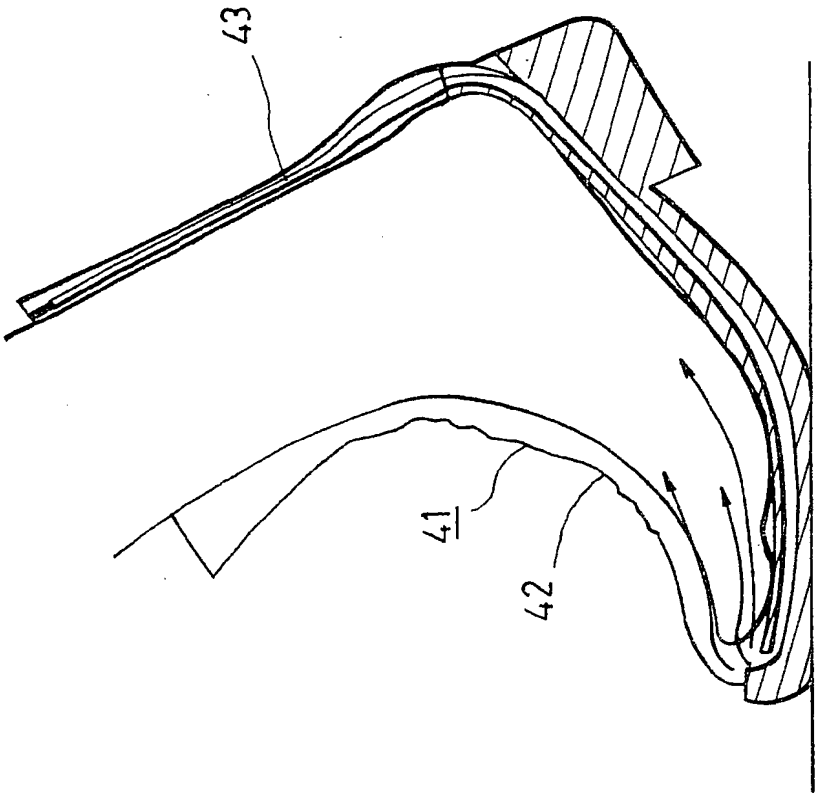

FIG13

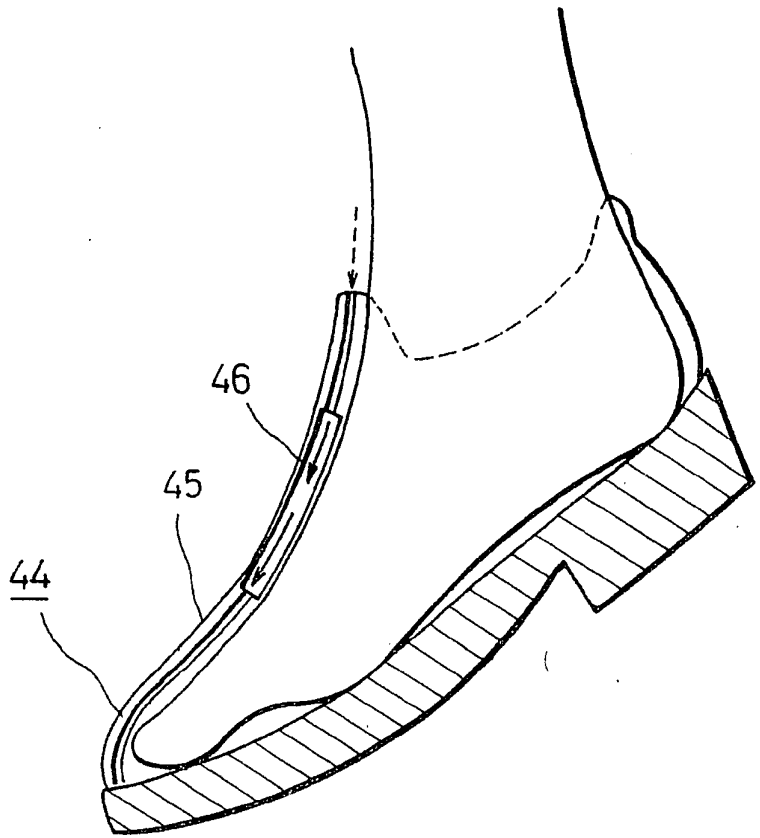

FIG.15

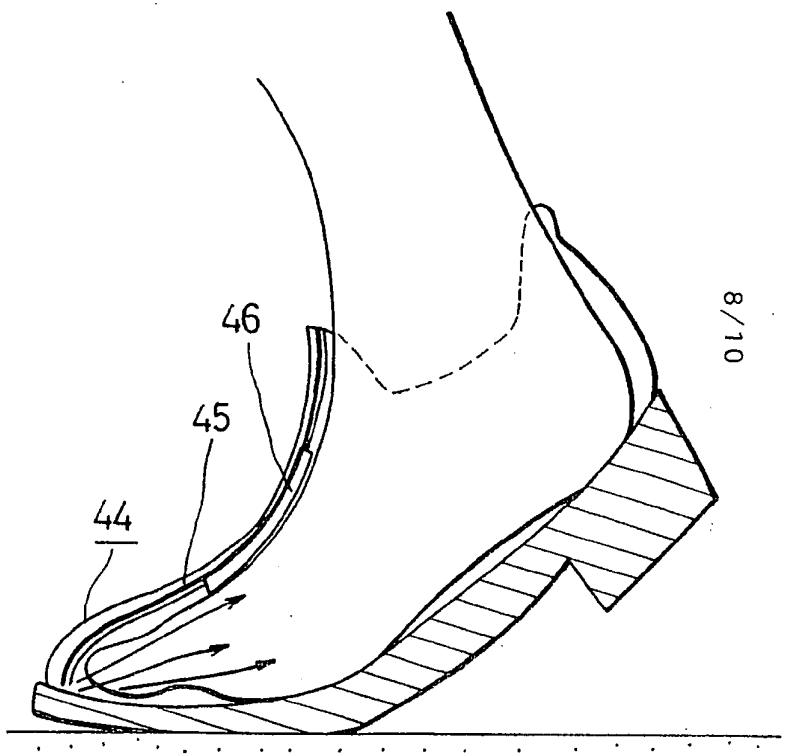

FIG.14

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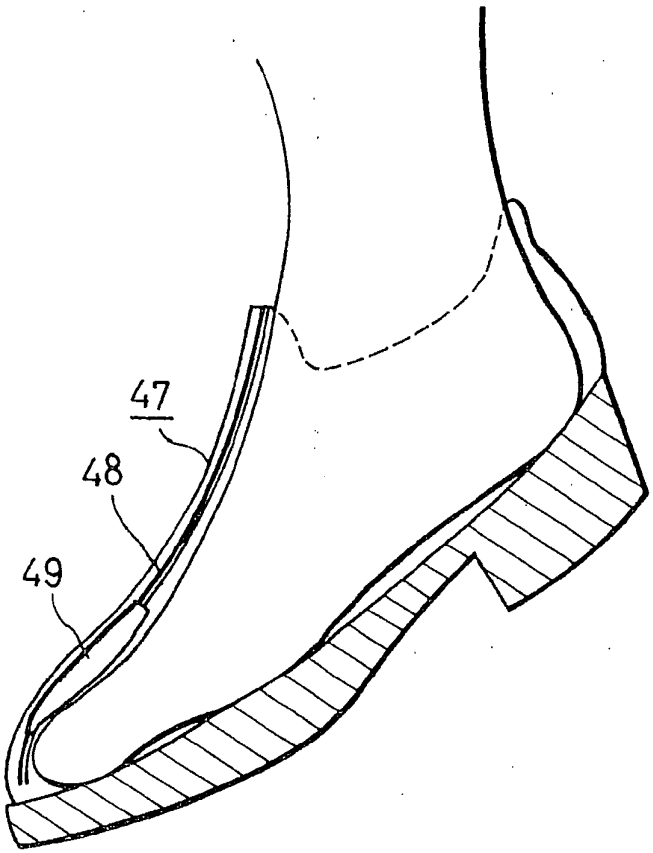

FIG.17

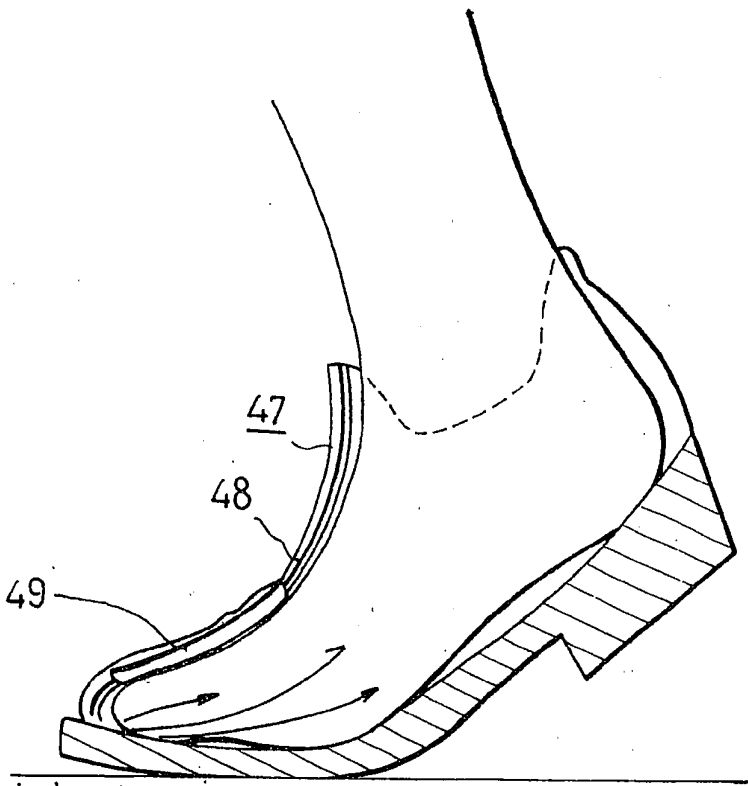

FIG.16

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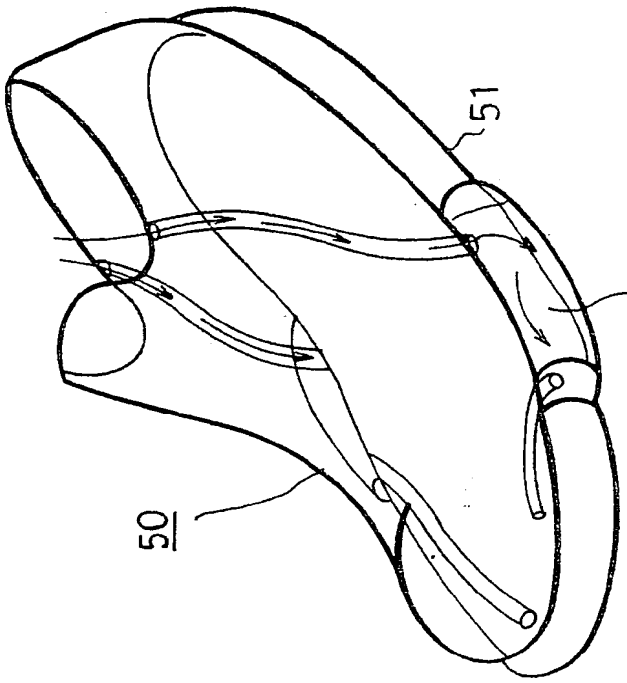

FIG.18

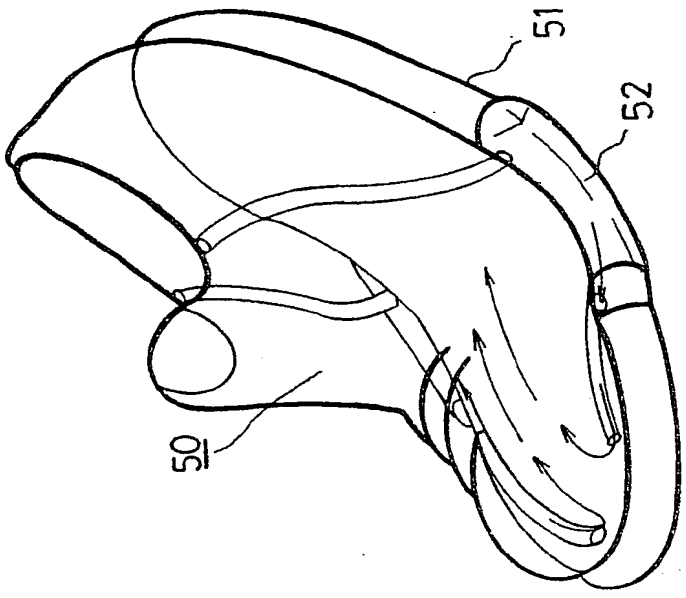

FIG.19

SPECIFICATION

Ventilating mechanisms for shoes

Background of the Invention

1. Field of the Invention

The present invention relates to a ventilating mechanism for a shoe which is adapted to eject odor within the shoe.

2. Description of the Prior Art

The prior art method for ejecting odor in the inside of a shoe includes providing two or three relatively small vent holes formed in the central lower portion of the instep part. With such an arrangement, however, as the ventilation itself is not forced, ventilating effect is limited to the region adjacent the vent holes. Furthermore, as dust, water or the like on the road surface also enters the shoe through the vent holes, ill effects caused by dust, water or the like from the outside of the shoe are more significant than ventilating effect to prevent stuffiness. Thus, such prior art arrangement does actually more harm than good, and it can be concluded that after all, such arrangement is provided for mere form's sake only to pretend to have an anti-stuffy effect. However, installation of a forced ventilator would cause difficulty in walking and, therefore, lacks practicability because of significantly large size and weight of such a ventilator itself incorporating a driving device.

Summary of the Invention

It is, accordingly, an object of the present invention to provide a ventilating mechanism for a shoe which will forcedly ventilate the shoe so that the interior of the shoe may be kept clean at all times.

It is another object of the present invention to provide a shoe ventilating mechanism which may be removable inserted into a shoe and which may readily be adapted to all types of shoes.

It is a further object of the present invention to provide a shoe ventilating mechanism which is mounted within a shoe without increasing the overall size and weight of the shoe.

It is a still further object of the present invention to provide shoes which are comfortable to wear and which may prevent the wearer from being tired with walking.

According to the present invention, there is provided a ventilating mechanism for a shoe which comprises an insole element formed of a resilient plastic material and removably inserted into the shoe. The insole element has a pump integrally formed therewith and adapted to draw air thereinto and expel air therefrom by alternating pressure and release forces applied thereto by the foot of a wearer. The pump has a pump chamber, a plurality of valved inlet ports for drawing the air passing through the pump chamber, and a plurality of valved outlet ports for directing the air toward the toe portion of the inside of the shoe.

In an alternative form of the invention, the shoe ventilating mechanism may be incorporated in a shoe. With this type of ventilating mechanism, a pump may be integrally formed with the sole part of the shoe, or it may be mounted on the instep part within the shoe. mechanism thus constructed walks, his body weight is applied on each shoe, or each shoe is deformed. As this occurs, the pump is actuated so that fresh air drawn from the inlet ports is sent through the outlet ports to the toe portion of the inside of the shoe, and air including odor in the inside of the shoe and especially in the toe portion is forced out by the fresh air from the pump to be ejected out of the shoe. Then, when the foot is raised, the shoe is released from the body weight or the deformation, and therefore fresh air is drawn from outside of the shoe into the pump. When the body weight is again applied to the shoe or the shoe is again deformed, the ventilating action as described above is repeated, preventing the shoe from being stuffy and keeping the same clean at all times.

The present invention will become more fully apparent from the claims and the description as it proceeds in connection with the drawings.

Brief Description of the Drawings

FIG. 1 is a perspective view of an insole element according to a first embodiment of the present invention;

FIG. 2 is a sectional side view of the insole element of FIG. 1;

FIG. 3 is a perspective view illustrating the insole element being inserted into a shoe;

FIGS. 4 and 5 are sectional side views illustrating the combination of the insole element and the shoe of FIG. 3 in use;

FIGS. 6 and 7 are sectional side views of a shoe ventilating mechanism according to a second embodiment, illustrating the invention in use;

FIGS. 8 and 9 are sectional side views of a shoe ventilating mechanism according to a third embodiment, illustrating the invention in use;

FIGS. 10 and 11 are sectional side views of a shoe ventilating mechanism according to a fourth embodiment, illustrating the invention in use;

FIGS. 12 and 13 are sectional side views of a shoe ventilating mechanism according to a fifth embodiment, illustrating the invention in use;

FIGS. 14 and 15 are sectional side views of a shoe ventilating mechanism according to a sixth embodiment, illustrating the invention in use;

FIGS. 16 and 17 are sectional side views of a shoe ventilating mechanism according to a seventh embodiment, illustrating the invention in use; and

FIGS. 18 and 19 are perspective views of a shoe ventilating mechanism according to an eighth embodiment, illustrating the invention in operation.

Detailed Description of Preferred Embodiments

Referring now to FIGS. 1 to 5, shown therein is a shoe ventilating mechanism constructed in accordance with a first embodiment of the present invention. As shown therein, the mechanism comprises an insole element 2 formed of a resilient plastic material and adapted to be laid on a sole part 3 of a shoe 1. The insole element 2 includes a pump 4 integrally formed therewith and adapted to draw air thereinto and expel air therefrom by application and release of the body weight of a wearer with respect to the sole part 3 of the shoe 1 through the insole element 2. The pump 4 has inlet ports 5 formed at the right and left sides of the

formed at the toe portion of the insole element 2. Inlet valves 7 are disposed at the respective inlet ports 5 and are adapted to be opened only when air is drawn in, and outlet valves 8 are disposed at the respective outlet ports 6 and are adapted to be opened only when air is discharged. The pump 4 includes a pump chamber 9 which is divided by partitions 10 into a number of small chambers or cells 11 communicating with one another by means of vent holes 12, the partitions 10 providing sufficient strength and cushioning effect to the insole element 2. The insole element 2 is also provided at the right and left sides of the heel portion with a pair of planar, upstanding air intake extentions 13 having air intake ports 14 for permitting ease of introduction of air into the inlet ports 5.

Now, the operation of the ventilating mechanism of the first embodiment is as follows. When a wearer of shoes 1 with the ventilating mechanism thus constructed walks, his body weight is applied onto the insole element 2 in each shoe 1 and thence, air in the cells 11 of the pump 4 flows through the vent holes 12 in a single direction and is fed under pressure from the outlet ports 6 into the inside of the shoe 1. Thus, the air including odor in the shoe 1 is forced out by the fresh air from the pump 4 to be ejected out of the shoe 1. Then, when the foot is raised, the insole element 2 is released from the weight and thence, fresh air outside of the insole element 2 is drawn, in a single direction, through the air intake ports 14 of the air intake extensions 13, passed through the inlet ports 5 into the pump 4. When the weight is again applied onto the insole element 2, the ventilating action as described above is repeated, preventing the shoe 1 from being stuffy and keeping the same clean at all times. It will be noted that the cells 11 in the pump chamber 9 provides cushioning effect, thereby making the shoe 1 remarkably comfortable to wear and preventing the wearer from being tired with walking. In addition, since the ventilating mechanism is arranged in the insole element 2 separate from the shoe 1, it can readily be adapted to all types of shoes. Further, since no openings have to be formed for ventilation at the right and left sides of the lower portion of the instep of the shoe, there is no fear of entrance of dust, water or the like from outside during ventilating action, and consequently the inside of the shoe 1 can be kept clean at all times.

Referring now to FIGS. 6 and 7 in which a second embodiment of the present invention is shown, a shoe 15 has an instep part 16 formed of sewed sheet material such as cloth and leather, and a sole part 17 formed of a resilient molded material such as rubber and synthetic resin. The shoe 15 is provided at the sole part 17 with a pump 18 integrally formed with the sole part 17 and adapted for drawing air thereinto and expelling air therefrom by application and release of the body weight of a wearer with respect to the sole part 17. The pump 18 has inlet ports 19 at the heel portion of the sole part 17 and outlet ports 20 at the toe portion of the sole part 17. Inlet valves 21 are disposed at the respective inlet ports 19 and are adapted to be opened only when air is drawin in, and outlet valves 22 pump 18 inlcudes a pump chamber 23 which is divided by partitions 24 into a number of small chambers or cells 25 communicating with one another by means of vent holes 26, the partisions 24 strengthening the sole part 17 and providing cushioning effect thereto. In this embodiment, the heel portion of the instep part 16 has air intake means or channels 27 for permitting ease of introduction of air into the inlet ports 19.

Now, the operation of the ventilating mechanism of the second embodiment is as follows. When a wearer of shoes 15 with the ventilating mechanism thus constructed walks, his body weight is applied onto each of the shoes 15 and thence, air in the cells 25 of the pump 18 flows through the vent holes 26 in a single direction and is fed under pressure from the outlet ports 20 into the inside of the shoe 15. Thus, the air including odor in the shoe 15 is forced out by the fresh air from the pump 18 to be ejected out of the shoe 15. Then, when the foot is raised, the shoe 15 is released from the weight and thence, fresh air outside of the shoe 15 is drawn, in a single direction, through the channels 27 formed at the heel portion of the instep part 16, passed through the inlet ports 19 into the pump 18. When the weight is again applied onto the shoe 15, the ventilating action as described above is repeated, preventing the shoe 15 from being stuffy and keeping the same clean at all times. It will be noted that the cells 25 in the pump chamber 23 provides cushioning effect, thereby making the shoe 15 remarkably comfortable to wear and preventing the wearer from being tired with walking. Additionally, in this embodiment, as the inlet ports 19 are formed in the inside of the shoe 15, there is no fear of entrance of dust, water or the like from outside during ventilation, and consequently the inside of the shoe 15 can be kept clean at all times.

Referring now to FIGS. 8 and 9 in which a third embodiment of the present invention is shown, a shoe 28 has an instep part 29 formed of sewed sheet material such as cloth and leather, and a sole part 30 formed of a resilient molded material such as rubber and synthetic resin. The shoe 28 is provided at the heel portion 30a of the sole part 30 with a pump 31 integrally formed with the sole part 30 and adapted for drawing air thereinto and expelling air therefrom by application and release of the body weight with respect to the heel portion 30a. The pump 31 has inlet ports 32 at the rear end of the heel portion 30a and outlet ports 33 at the front end thereof. Inlet valves 34 are disposed at the respective inlet ports 32 and are adapted to be opened only when air is drawn in, and outlet valves 35 are disposed at the respective outlet ports 33 and are adapted to be opened only when air is released. The shoe 30 is provided at the heel portion of the instep part 29 air intake means or channels 36 for permitting ease of introduction of air into the inlet ports 32, and furthermore, the shoe 30 includes a desired number of air exit passages 37 determined according to the diameter thereof, capacity of the pump or others which extend through the sole part 30 except the heel portion 30a to supply the fresh air from the pump 31 to the toe portion in the shoe 28.

wearing the shoes 28 with the ventilating mechanism thus constructed walks, his body weight is applied onto each of the shoes 28 and thence, air in the pump 31 is fed under pressure through the air exit passages 37 in a single direction into the toe portion in the shoe 28, and the air including odor in the shoe 28 is forced out by the fresh air from the pump 31 to be ejected out of the shoe 28. Then, when the foot is raised, the shoe 28 is released from the weight and thence, fresh air outside of the shoe 28 is drawn, in a single direction, through the channels 36 formed at the heel portion of the instep part 29, passed through the inlet ports 32 into the pump 31. When the weight is again applied onto the shoe 28, the ventilating action as described above is repeated, preventing the shoe 28 from being stuffy and keeping the same clean at all times. In addition, as the pump 31 provides cushioning effect, the shoe 28 becomes remarkably comfortable to wear and prevents the wearer from being tired with walking. Further, in this embodiment, as the inlet ports 32 are formed in the inside of the shoe 28, there is no fear of entrance of dust, water or others from outside during ventilation by means of the pump 31, and consequently the inside of the shoe 28 can be kept clean at all times.

FIGS. 10 and 11 show a fourth embodiment of the present invention. The construction, operation and effect of the fourth embodiment are substantially the same as those of the third embodiment except that a pump 40 similar to the pump 31 in the third embodiment is formed in the front portion of the sole part 39 of a shoe 38 including the toe portion and the surroundings thereof.

FIGS. 12 and 13 show a fifth embodiment of the present invention. The construction, operation and effect of the fifth embodiment are substantially the same as those of the third embodiment except that a pump 43 similar to that of the third embodiment is formed at the rear inside of the instep part 42 of a shoe 41 and is adapted to be actuated by varying attitude of the shoe 41 during walking.

FIGS. 14 and 15 show a sixth embodiment of the present invention. The construction, operation and effect of the six embodiment are substantially the same as those of the third embodiment except that a pump 46 similar to that of the third embodiment is provided at the front central inside of the instep part 45 of a shoe 44 and is adapted to be actuated by varying attitude of the shoe 44 during walking.

FIGS. 16 and 17 show a seventh embodiment of the present invention. The construction, operation and effect of the seventh embodiment are substantially the same as those of the third embodiment except that a pump 49 similar to that of the third embodiment is provided in the vicinity of the front toe portion of the instep part 48 of a shoe 47 and is adapted to be actuated by varying attitude of the shoe 47 during walking.

FIGS. 18 and 19 show an eighth embodiment of the present invention. The construction, operation and effect of the eighth embodiment are substantially the same as those of the third embodiment except that pumps 52 similar to that of the third embodiment are provided at the sides of the sole part 51 of a shoe 50 the shoe 50 during walking.

While the invention has been described with reference to preferred embodiments thereof, it is to be understood that modifications or variations may be easily made without departing from the scope of the present invention which is defined by the appended claims.

CLAIMS

1. A shoe having a ventilating mechanism including an air passage opening at one end to the interior of the shoe near to the toe and opening at the other end to the exterior of the shoe, the passage being at least partly formed of resilient material which is repeatedly flexed as the wearer walks to change the size of the passage so as to pump air through the passage.

2. A shoe according to claim 1 wherein the ventilating mechanism is in the sole.

3. A shoe according to claim 2 wherein the ventilating mechanism is in a separate insole.

4. A shoe according to claim 1 wherein the ventilating mechanism is partly in the upper.

5. A shoe according to any preceding claim including at least one one way valve in the passage.

6. A shoe according to claim 5 wherein the valve is arranged such that the outlet of the passage is the opening near to the toe.

7. A ventilating mechanism for a shoe having an instep part and a sole part, said mechanism comprising an insole element formed of a resilient plastic material to be removably inserted into the shoe, said insole element having a pump integrally formed therewith and adapted to draw air thereinto and expel air therefrom by alternating pressure and release forces applied thereto by the foot of a wearer during walking, said pump having a pump chamber, a valved inlet port formed in a heel portion of said insole element and operable to draw in the air to pass through said pump chamber, a valved outlet port formed in an upper toe portion of said insole element, and operable to direct the air toward the toe portion of the inside of the shoe, whereby as the wearer walks, alternating suction and compression forces are caused in said pump chamber, thereby permitting one-way transfer of air drawn through said inlet port to said outlet port.

8. A mechanism according to claim 7 including a plurality of inlet ports and a plurality of outlet ports.

9. A mechanism according to claim 7 or 8 wherein the or each inlet port is formed in an upper heel portion of the insole element.

10. The ventilating mechanism as defined in claim 7, 8 or 9 wherein said pump chamber is separated into a number of cells by partitions including vent holes.

11. The ventilating mechanism as defined in claim 7, 8, 9 or 10 wherein said sole element further has a pair of planar, upstanding air intake extensions integrally formed therewith at the right and left sides of the heel portion thereof for facilitating introduction of air into inlet ports.

12. A shoe having an instep part formed of sheet material such as cloth and leather, and a sole part formed of resilient material such as rubber and synthetic resin, a mechanism for ventilating the shoe comprising at least one pump adapted to draw air

pressure and release forces applied thereto by repeated deformation of the shoe during walking, said pump having a pump chamber, a valved inlet port for drawing the air passing through said pump chamber, and a valved outlet port for directing said air toward the toe portion of the inside of the shoe, whereby as a wearer walks, alternating suction and compression forces are caused in said pump chamber, thereby permitting one-way transfer of the air drawn through said inlet port to said outlet port.

13. A shoe according to claim 12 wherein the pump is mounted on the shoe.

14. A shoe according to claim 12 or 13 further comprising at least one air exit passage formed within and extending through said sole part for air flow communication with the interior of the shoe through the toe portion of said sole part, said pump being mounted generally on the rear inside of the instep part with said outlet port connected in air flow communication with said air exit passage.

15. A shoe according to claim 12, 13 or 14 wherein said pump is mounted generally on the front central inside of said instep part of said shoe with said outlet port directed toward the toe portion of said shoe.

16. A shoe according to claim 12, 13 or 14 wherein said pump is mounted generally on the front toe portion of said instep part of said shoe with said outlet port directed toward the toe portion of said shoe.

17. A shoe according to claim 12, 13 or 14 wherein said pump is mounted on the side portion of said sole part of said shoe with said inlet port directed toward the toe portion of said shoe.

18. A shoe according to claim 12 wherein said pump is integrally formed with the sole part of the shoe.

19. A shoe according to claim 18 wherein there is a plurality of inlet and outlet ports with respective inlet and outlet valves.

20. A shoe according to claim 18 or 19 wherein said pump is formed over the entire length of said sole part of said shoe with said inlet ports located generally at the heel portion of said sole part and with said outlet ports located generally at the toe portion of said sole part.

21. A shoe according to claim 18, 19 or 20 further comprising air exit passages formed within and extending through said sole part except the heel portion thereof, said pump being formed generally within the heel portion of said sole part with said outlet ports connected in air flow communication with said air exit passages, respectively.

22. A shoe according to claim 18 or 19 wherein said pump is formed generally within the front half part of said sole part of said shoe with said outlet ports located at the inside toe portion of said sole part.

23. A shoe having a ventilating mechanism and constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

24. An insole element for a shoe, such element being constructed and arranged substantially as hereinbefore described with reference to and as illustrated in Figs. 1 to 5 of the accompanying

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